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Water and Sanitation for Africa

Socio-economic factors affecting the adoption of Ecological Sanitation approach in Benin

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Outline

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2- Methodology

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Introduction

- The lack of sanitation is one of the major challenges in Benin: only 1/3 of households have an access to adequate sanitation facilities. Open defecation is the common practices in rural areas (more than 60%).

- **Consequences**: Diarrhea of children under five Years is the 3rd cause of consultation and the 4th cause of hospitalization in Benin

- The 2nd most important challenge is the depletion of soil fertility which contributes to low yields and poor food security

Introduction

- To tackle these problems in Benin WSA has introduced EcoSan in many communities since 2002

- Since 2002, several studies took place, but the factors that affect the adoption of this approach are not known.

- This study aims to highlight the socio-economic factors that affect the adoption of ECOSAN approach

Methodologies
(Choice of study areas)

Study areas

- Criteria of study areas choice: where WSA and his partners are promoting Ecosan

- Southern-west of Benin in two administratives regions (Oueme and Couffo)

- Data are collected between 2009 and 2010

Methodologies
(Sampling)

- Fifteen (15) villages are randomly selected from a list where WSA intervenes.

- The household sampling is a stratified random type.

- The two stratification criteria are: adopting and not adopting of the ECOSAN approach.

- In total, 272 households are selected

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Methodologies
(A model for analyzing adoption decision)

- The decision to adopt is modeled following Saha and al. (1994) and Dimara and Skuras (2003) who stated that farmers can only adopt a technology if they are aware of it.

- For empirical analyzing related to factors influencing the adoption of the ECOSAN approach, the Probit model is used

- The probability that a farmer j adopts the approach is:

$$P_j = P(Y=1) = F(I_j) = \int_{-\infty}^{It} \frac{1}{\sqrt{2\pi}} \exp(\frac{-t^2}{2}) dt$$

I_j is a linear combination of Independents variables X and α is coefficients to be estimated and Whose expression is:

$$I_j = \sum_{n=1}^{N} \alpha_n X_{nj}$$

X_{nj} represents the nth explanatory variable and α_n the parameter to be estimated which corresponds to the independent variable Xnj

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Methodologies
(steps in analysis)

Step 1
- Probit model was estimated to determine the factors that influence the probability of being aware of ECOSAN approach

Step 2
- Using the sub - sample of farmers aware of ECOSAN approach, the determinants of adoption decision are identified by the method of Heckman (1979). To reduce selection bias, Heckman (1979) suggests a two-stage estimation
- Based on the model of Castaño and al. (2005) that links the adoption of new technologies to institutional, social, economic and physical factors we have chosen the suspects variables which are included in the model

Step 3
- Using the sub - sample of farmers aware of the ECOSAN approach, the effect of the source of information on the decision to adopt the ECOSAN approach is measured. The LR test allows measuring the difference between two subgroups (group informed by extension agents and the other informed by their colleagues or members of local health committees) of a sample

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Results and discussions
(Perceptions of respondents about ECOSAN approach)

Table n°3: Perceptions of respondents about ECOSAN approach

Perceptions about:	RESPONSES		
	YES	NO	Without opinion
Approval of crops by consumers if they know that fertilization are made with safe excreta	163 (68%)	78 (32%)	0%
High initial investment cost for building ECOSAN facilities	45 (19%)	196 (81%)	0%
Ease of utilization of ECOSAN facilities	160 (66%)	81 (34%)	0%.
Difficulty of utilization of ECOSAN fertilizers compared to mineral fertilizers	71 (29%)	170 (71%)	0%.
Competitiveness of ECOSAN fertilizers	126 (52%)	3 (1%)	112 (47%)

Source: Field inquiry, 2010

Results and discussions
(Factors affecting the probability of awareness of ECOSAN approach)

Table n°4: Results of estimating of information model

Variables	Coefficients	Std. Err.	P> ızı
Education level	$0,1477662^{ns}$	0,2810065	0,599
Contact with extension agents and/or local health committees	$\mathbf{0,9602196^{**}}$	0,4210436	0,023
Membership of a cooperative	$0,3946458^{ns}$	0,2327371	0,090
Severity of soil depletion	$0,1875323^{ns}$	0,2461868	0,446
constant	$0,8526357^{***}$	0,2432933	0,000

Numbre of observations =   268

Wald chi2(4)   =   10.22   Log pseudolikelihood = -82.239706
Prob > chi2   =   0.0369**   Pseudo R2   =   0.0608

% of correct prediction =89.93%

Source: Field inquiry, 2010 ns= no significance   **P<0,05 ***P<0,01

Results and discussions
(Factors affecting adoption decision of ECOSAN approach)

Table n°5: Estimation results of adoption model of ECOSAN approach

Variables	Coefficients	Std. Err.	P> ızı
Credit access	$0{,}567782^{ns}$	0,304201	0,062
Membership of a cooperative	$0{,}2019257^{ns}$	0,23653	0,393
Perception of consumer reaction	$0{,}0363033^{ns}$	0,220313	0,869
Perception of initial investment cost	**$-1{,}011678^{***}$**	**0,274116**	**0,000**
Perception of ease of ECOSAN	**$0{,}7875392^{***}$**	**0,230135**	**0,001**
Perception of ECOSAN effectiveness	**$0{,}4281362^{**}$**	**0,216388**	**0,048**
Age	**$0{,}8834762^{***}$**	**0,337173**	**0,009**
Education level	**$0{,}7952091^{***}$**	**0,262171**	**0,002**
riskc	$0{,}3535351^{ns}$	0,266962	0,185
Mills	$2{,}219627^{ns}$	1,26347	0,079
Cons	$-4{,}038061^{***}$	1,35776	0,003

Number of observations = 241 **Prob > chi2 = 0.0000*****

Wald chi2(10) = 61.50   Log pseudolikelihood = -104.21752   Pseudo R2 =
0.2909

% of correct prediction 79, 25%

Source: Field Inquiry, 2010 ns= no significant **P<0,05 ***P<0,01

Results and discussions

(Analysis of effect of different sources of information)

Table n°6: Estimated adoption model of ECOSAN approach according to information source

	ADOPTION EQUATION					
	Informed by extension agents			Informed by local health committees		
Variables	Coefficients	Std. Err.	$P> \lvert z \rvert$	Coefficients	Std. Err.	$P> \lvert z \rvert$
Credit	$0,178229^{ns}$	0,380658	0,64	**1,970481****	0,77965	0,011
MembCoo	2,187073**	0,72195	0,002	$-2,33354^{ns}$	1,45738	0,109
achapc	$0,20802^{ns}$	0,27743	0,453	$0,253636^{ns}$	0,59806	0,671
Pcostc	-1,289869***	0,327319	0,000	$-0,721618^{ns}$	0,68019	0,289
Peasyc	0,641878***	0,248573	0,010	1,975828**	0,85372	0,021
Peffc	0,593366**	0,287871	0,039	$-0,446249^{ns}$	0,65417	0,495
Age	$0,905817^{ns}$	0,488198	0,064	$0,704652^{ns}$	0,63909	0,270
neduc	1,114174**	0,364291	0,002	$0,234078^{ns}$	0,83763	0,780
riskc	$0,809969^{ns}$	0,443549	0,068	$-0,491985^{ns}$	0,57265	0,390
Mills	16,43772**	5,272782	0,002	$-47,55004^{ns}$	33,5715	0,157
Cons	-8,387833***	2,411544	0,001	$-0,408748^{ns}$	3,33745	0,903

Number of observations = 188
LR chi2(10) = 80.26
Prob > chi2 = 0.0000
Log likelihood = -72.603861
Pseudo R2 = 0.3560

Number of observations = 53
LR chi2(10) = 24.71
Prob > chi2 = 0.0059
Log likelihood = -20.509215
Pseudo R2 = 0.3759

LR chi2(11) = 22.21
Prob > chi2 = 0.0228

Source: Inquiries, 2010 ns= no significant **P<0,05 ***P<0,01

Conclusion

- Estimation of Probit models shows that five (5) variables affect the probability of ECOSAN adoption. Also, it shows that it is necessary to model awareness before modelling adoption

- These variables are: perception of the initial investment cost, perception of ease of utilization of ECOSAN principles and of reuse of safe excreta in agriculture, age, education level and perception of the competitiveness of ECOSAN fertilizers compared to mineral fertilizer

- The source of information influences the adoption of ECOSAN approach. Households are more convinced by extension agents of WSA and his partners engaged in the extension of the approach

Implications

➢ Exposition of farmers to information about Ecosan by contact with extension agents or local health commitees is necessary to improve the rate of Ecosan adoption;

➢ To improve the rate of adoption and sustainable the impact of actions, it is important to make strong the capacities of members of local health committees to convince communities about ECOSAN approach

➢ Ecosan adoption depends greatly on many perceptions. Therefore, demonstration pilot project must be done to improve the chance of integrating safe excreta in farming fertilization practices

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Thank you

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